3.0 SUMMARY OF ASSUMPTIONS, LIMITATIONS AND ERRORS

This section of ASP I summarizes assumptions, limitations, and known errors of ESAMS derived from any and all applicable sources (especially V&V), and addresses the implications of these for model use or application. This information is useful in helping a user to determine if the model adequately addresses all the radar, missile flyout, and endgame phenomena and environmental conditions that are important to the intended application. This summary also provides a method for integrating assumptions, limitations, and errors discovered during other V&V efforts.

Details of the assessment procedures for assumptions, limitations, and errors can be found in Sections 2.1 and 3.1 of *An Accreditation Support Framework for DoD M&S* [1].

The assumptions and limitations presented in sections 3.1 and 3.2 are taken from the *ESAMS Post-Development Design Document* (PD^3) [17], being written by the SMART Project independent verification agent. Substantial portions of the PD^3 can be found in the Conceptual Model Specification (CMS) sections of ASP II.

Model deficiencies that have been reported to SURVIAC are tabulated in section 3.3. In accordance with the configuration management plan, all reported software and documentation deficiencies that pertain to version 2.7 will be reviewed by the CCB for resolution. Those software or documentation deficiencies that are considered to be enhancements to the current model version will be reviewed but deferred for integration until the development phase of the next model version (2.x). In Section 3.3, the MDRs for version 2.7 and 2.x are tabulated separately. An MDR summary for earlier versions of ESAMS can be found in Appendix B.

The reader should keep in mind that not all of the reported MDRs are errors in the model implementation. Some of the reported problems arise from incorrect model usage or output interpretation. These problems are usually resolved by the CCB and the MDR is rejected. Other problems arise from changes in intelligence assessments. These MDRs often cannot be resolved by the CCB and must be referred to the appropriate intelligence agency for authentication.

3.1 ASSUMPTIONS

The following assumptions are divided into three groups: data format assumptions, which describe how a model's software handles data internally; general assumptions, which define how the model emulates overall sensor, flyout, and endgame functionality; and missile function-specific assumptions, which are related to some specific subordinate functionality within the model. Other, more detailed assumptions may be found in the appropriate subsections of ASP II.

3.1.1 Data Format Assumptions

The following data format assumptions affect the way missiles are modeled in ESAMS. Except as noted, the source for each assumption is the *ESAMS Analyst’s Manual* [12].

1. Time is measured in seconds.

   Implications for Use: The user should ensure that input data are specified, and that output data are interpreted, in the correct units.

2. Distances are measured in meters.

   Implications for Use: Since no conversions are provided between meters and feet, statute miles, nautical miles, and data miles, the user should ensure that input data are specified, and that output data are interpreted, in the correct units.

3. Temperatures are specified in degrees Kelvin.

   Implications for Use: None.

4. Mass is specified in kilograms.

   Implications for Use: None.

5. Angle of attack and target orientation, including heading, pitch, and roll are specified in degrees; other angles are specified in radians.

   Implications for Use: The user should ensure that input data are specified, and that output data are interpreted, in the correct units and according to appropriate conventions.

6. There will be some small differences in the execution of the ESAMS code compiled on different computer types; e.g., a SPARC10 versus a PC or a VAX/VMS. Likewise, there could be small differences on the same machine type (e.g., a PC) using a DOS compiler versus a UNIX compiler. These differences arise from several sources: different floating-point representations in the hardware, different intrinsic functions; differing sets of software functions (in the compiler library) or hardware coprocessor calls; errors in the implementation of both hardware and software; and differences in the compilers' optimization techniques.

   Implications for Use: Any such differences should be minor (i.e., not detectable in discrete data in the first four or five significant digits).

   The only known problem of this sort has been in the host platform library random number routines, which are machine dependent. There are significant differences in the calling/returning parameters and even in the routine names and calling sequences between compilers. This kind of difference could be eliminated by an ESAMS-specific random number generator, but this problem has not become serious enough to warrant its development.

3.1.2 Modeling Assumptions

This section describes general assumptions and limitations for ESAMS. More detailed assumptions and limitations are included in the detailed design descriptions for each Functional Element (FE) in ASP II. The user can also refer to the ESAMS user's and analyst's manuals for additional details.

ESAMS reflects the assumptions upon which its input data for radar guidance and control, autopilot, thrust, aerodynamic, and warhead data are based. At the model level, there are also assumptions about the types of engagements ESAMS models. The assumptions listed below are categorized under the headings of General, Radar, Guidance and Control, Endgame, and Other. The source of each assumption is the *ESAMS User's Manual* [13].

General

1. Analysts using ESAMS should be thoroughly familiar with surface-to-air missile systems, so that the user-supplied input data are reasonable.

   Implications for Use: Input consists of engineering-level data describing the missile's radar, guidance and control, and fuzing and blast systems. ESAMS does not check the data for engineering validity.

2. The analyst is restricted to one-vs-one scenarios.

   Implications for Use: ESAMS may not be the appropriate tool for complex, multi-aircraft scenarios.

3. Each engagement is an independent event; no interaction between sites or launches is provided.

   Implications for Use: ESAMS may not be the appropriate tool for tactical analysis of SAM threats.

4. The digital terrain facets will, in general, exhibit slope discontinuities at the edges if they are tilted. See the *ESAMS Analyst's Manual* [12] for more details on terrain data.

   Implications for Use: For those backscatter algorithms that are, or might be, based on geometric reflection assumptions, there may be periodic, strong flashes which do not occur in reality.

5. In the native (default) mode, ESAMS uses a locally Euclidean (flat earth) approximation.

   Implications for Use: Target and clutter masking beyond the radar horizon are correctly determined based on antenna height and atmospheric refraction. The flat earth assumption introduces potential errors only in target elevation and aspect angles for longer range engagements. This may cause errors if the target RCS is sensitive to changes in elevation angle.

   Using the GRACE processing option, the earth's curvature and refraction are explicitly considered.

Radar

1. Only one RCS is allowed per flyout.

   Implications for Use: Only the tracking radar or illuminator frequency can be used. The effect of bistatic RCS for the seeker is a geometric mean of the monostatic signatures between the target and radar line of sight (LOS).

2. The RCS is assumed to be laterally symmetric, i.e., the left half and the right half of the air vehicle are identical.

   Implications for Use: ESAMS may not be the appropriate tool for studies involving asymmetric targets.

3. The RCS signature is a point source. Near-field effects are only modeled for fuzing.

   Implications for Use: In actuality, RCS is a combination of scattering centers, the centroid of which is a function of aspect angle. The impact on tracking errors of modeling RCS as a point source is generally not significant.

   The target is always in the far field for tracking radars; therefore, modeling near-field effects has no impact except for fuzing.

4. Sources of noise, except jamming, are modeled stochastically.

   Implications for Use: When using noise options, it is necessary to run each flyout several times to generate results of statistical significance. The number of runs required is dependent on the exact scenario, and in general ranges from 3 to 30 replications.

5. The clutter model uses the terrain type only. It does not use the tilts associated with the digital terrain.

   Implications for Use: The database used for clutter reflectivity already accounts for terrain roughness.

6. ESAMS does not model antenna scanning during target acquisition. The radar antenna is initially boresighted on the target (“perfect cueing”).

   Implications for Use: This modeling assumption implicitly assumes that the acquisition radar can scan in elevation and that the target position is updated with each pulse. Some of the SAMs modeled actually use rotating acquisition radars that are oriented at fixed elevation angles or have multiple beams at different elevation angles. Other radars use electronically scanned phased arrays to scan an acquisition volume with various dwell patterns. In both cases, initial detection range is sensitive to target elevation angle and the antenna gain at that angle. In addition, the target update rate will occur at the antenna scan frequency or beam dwell frequency rather than at the radar PRF.

Guidance and Control

1. A four-step Runge-Kutta integration is used with a fixed time step. There is no internal checking on the accuracy of the results. The time step has been chosen to generate stable results under the expected regime of input data. A speed-up option can be invoked to increase the time step up to eight times under certain circumstances.

   Implications for Use: Arbitrary increases of computation interval without regard to eigen values can produce significant modeling errors in integrated variables.

2. Euler integration is used for the autopilots.

   Implications for Use: None.

3. Missile motion is simulated with a five-degree-of-freedom (5-DOF) model except in the CADS-1 missile. 5-DOF computes profiles for trajectories based on positional changes in X, Y, and Z and angular changes in pitch and yaw. 5-DOF assumes a constant missile roll angle.

   Implications for Use: The impact of roll stabilization upon intercept capability remains to be determined. It is likely to be a function of the type of missile and its guidance modes.

4. The commands uplinked and downlinked from the missile are assumed to be error free.

   Implications for Use: This assumption is based on a very high SNR, which is generally a good assumption for command-guided missiles.

Endgame

1. Endgame calculations assume equivalent dimensions of height and width of vulnerable aircraft components in determining the probability of kill due to warhead fragmentation.

   Implications for Use: As a result, when building a presented area table, one should place a constant value (equal to the product of the component's length and width) in all positions. ESAMS only uses presented area table data to compute the amount of vulnerable area in the spray, ratioing the presented area based on the aspect angle at intercept. See the *ESAMS Analyst’s Manual* [12] for more details.

2. Fuzing is generally dependent on the specification of glitter points and a fixed delay time. The requirements of some fuzes to accumulate energy to some level before detonation is only modeled when the advanced fuze model is selected.

   Implications for Use: As a result, caution should be exercised when using Pk data. This is especially true for high-speed intercepts and intercepts with small targets or targets with small signatures.

3. The miss distance is calculated from the target and missile position at fuzing. Closest point of approach (CPA) may occur at a later time or at a simulation-ending condition.

   Implications for Use: Caution must be exercised when using the CPA data, especially for maneuvering targets and where the miss distance may be large.

3.2 LIMITATIONS

There are several kinds of limitations in ESAMS:

1. computer system limits (real number arithmetic, byte/word size, etc.);

2. embedded parameter limits in the code;

3. functional limits related to field test data; and

4. general functional limits (not all FEs are fully implemented in any model).

3.2.1 Computer System Limitations

These are generally dealt with by the vendor of the compiler by adherence to some external standards. Trivial examples include the limits of values which can be portrayed in INTEGER or REAL variables.

Implications for Use: None.

3.2.2 Parameter Limitations

Parameters embedded in the code, such as the maximum number of flight path points, may be changed by the user, and the code recompiled. Some of the more important limitations are listed below; consult the *ESAMS User's Manual* [13] for a complete list of parameter limitations.

1. The maximum number of flight path points is currently limited to 1200. This is changeable at compilation time. See the *ESAMS User's Manual* [13] for details.

   Implications for Use: Both the path length and system dynamics ought to determine the limit to the number of points: although the existing limit appears to be adequate, cases may occur where the coarseness of data excites other limits inappropriately.

2. The maximum number of replications when using Monte Carlo replications is limited to 50. See the *ESAMS User's Manual* [13] for details on changing this value.

   Implications for Use: Based on independent analysis, this limit should be adequate for most applications.

3. A maximum of 10 terrain files can be input by the model. A maximum of 175 terrain squares (of 40 x 40 points) can be input. See the *ESAMS User's Manual* [13] for details on changing this value.

   Implications for Use: none.

4. The maximum number of sites is 500.

   Implications for Use: Some users use rectangular or circular grids of sites to compute SAM engagement envelopes. This limit may restrict the grid resolution; however, alternative approaches using multiple shots are possible.

3.3 ERRORS AND ANOMALIES

As noted at the beginning of this section, a number of errors have been discovered by ESAMS users and during SMART Project V&V efforts. Tables 3.3-1 and 3.3-2 summarize the current MDRs. Table 3.3-1 contains MDRs that pertain to errors in version 2.7, while Table 3.3-2 contains MDRs that relate to enhancements in version 2.7 and will not be integrated until the development phase of the next model update. For each MDR, a brief description, its implications, date of review by the CCB, and CCB decision is listed.

TABLE 3.0-1. Model Deficiency Reports for ESAMS 2.7.

MDR	Description	Implications for Use	Date Last Reviewed	Decision
1	Different internal and external names for common block SURGEC.		1/96	Approved
2	Array dimension error in subroutine INIFLT.	Model aborts on VAX when running CADS-1.	1/96	Approved
3	Non-ASCII character in subroutine CLRSIM.	Causes compilation error on VAX.	1/96	Approved
4	Linkage editor error on VAX: undefined symbol in subroutine ZONSIZ.	Precludes successful linking of executable.	1/96	Approved
5	Untyped variable (IMAG) in subroutine ZROOTS.	Causes compilation error on VAX.	1/96	Approved
6	Error in SA-8 launch computer.	Model generates different results for targets inbound from positive and negative x-axes.	1/96	Pending
7	Factor of $(4\pi)^3$ missing in subroutine CHDPLR.	Causes overestimation of chaff signals.	1/96	Approved
8	Divide by zero when antenna boresight equals the clutter evaluation cutoff angle.	Erroneous results when this condition occurs.	1/96	Approved
9	No distinction between angle and Doppler tracking when using anti-VGPO.	May cause over-triggering of anti-VGPO and poorer tracking performance.	1/96	Pending
10	LOAL/LOBL logic for the SA-j seeker.	Causes simulation to abort if acquisition does not occur immediately.	1/96	Pending
11	Variable fuzing delays for certain missiles are not modeled.	May degrade warhead effectiveness in the endgame.	1/96	Approved
12	User is not alerted to missing target data when triangular target model is used (OPTANT=4).	If triangular target data is missing, only small miss distances will result in non-zero Pks.	1/96	Approved
13	The native multipath algorithms need to be validated and extended to seeker multipath.	Unknown confidence in ESAMS multipath modeling.	1/96	Pending
14	SA-w radar performance does not match latest intelligence estimates.	Model estimates of SA-w effectiveness are not correct.	1/96	Pending
15	Correlation time for scintillation is defaulted to zero.	Target signature fluctuations due to scintillation are unrealistic.	1/96	Approved
16	Use of clutter notches should be a default model input based on intelligence data, not a user input.	User may overestimate clutter rejection if notches are specified for threats that don’t have them.	1/96	Pending
17	Surge detector data does not match current intelligence.	ECCM capability may not be correctly modeled.	1/96	Pending
18	Radar performance data form many systems doesn’t match intelligence estimates.	Potential errors in ECM effectiveness modeling.	1/96	Pending
19	Incorrect representation of TWS radars.	May result in detection ranges greater than expected.	1/96	Pending
20	GHK range track filter is incorrectly initialized.	May cause problems for the tracker to lock onto high-speed targets.	1/96	Pending
21	Angle rates for the SA-p are incorrectly limited.	May cause model to abort for certain engagement geometries.	1/96	Pending
22	The CW burst for the SA-w seems to be initiated at the wrong time.	May cause problems with warhead fuzing.	1/96	Pending

TABLE 3.0-1. Model Deficiency Reports for ESAMS 2.7. (Contd.)

MDR	Description	Implications for Use	Date Last Reviewed	Decision
23	Use of missile aerodynamic data is inconsistent with the source documentation.	Probably not a significant source of error.	1/96	Approved
24	Variable WVLTX is undefined in subroutine WFALON.	May cause divide by zero.	1/96	Rejected
25	Variable IENTRS exceeds the array dimension in subroutine AFMINI.	May cause code or data to be overwritten.	1/96	Rejected
26	Variables DGAINA and DGAINE are undefined in subroutine FENDI.	May cause divide by zero.	1/96	Rejected
27	Array dimension overflow in subroutine NAMFND.	May cause code or data to be overwritten.	1/96	Approved
28	Extraneous files in /ale50 directory.	May cause user confusion.	1/96	Pending
29	Flare countermeasure option does not work.	Precludes analysis of IR countermeasures.	1/96	Pending
30	Errors in User's Manual.	May cause model implementation errors.	1/96	Approved
31	Errors in Appendix B, of User's Manual: PROGC Variables are missing, defined wrong, or no longer used.	May cause model implementation errors.	1/96	Approved
32	Common blocks have no comments.	Makes software analysis difficult.	1/96	Approved
33	Calculation of missile AZ and EL w.r.t. target does not correctly include target yaw, pitch, and roll. AZ and EL of site w.r.t. target not computed.	The variables affected are only used for output, but may cause erroneous interpretations of model results.	1/96	Approved
34	There are multiple errors in the provided run scripts for compiling and linking ESAMS when used on SGI computers.	May cause difficulty in compiling and linking.	1/96	Approved
35	Singular condition exists when Euler angles equal 90^o.	May cause overflow and erroneous results.	1/96	Rejected
36	Error in exponent of sea clutter equation in subroutine CLUTIN.	Value of sea clutter reflectivity will be too large.	1/96	Approved
37	Error in determining if minimum range to clutter is within the radar horizon.	May cause singular condition when boresight elevation is equal to clutter cutoff angle.	1/96	Rejected
38	Ground range is used instead of slant range in clutter calculation.	May erroneously preclude clutter calculation when clutter is present.	1/96	Rejected
39	Speed of light factor is missing in subroutine RANMIN for clutter calculation.	Some small amount of extraneous clutter will be calculated.	1/96	Rejected
40	IEEE underflow	Model aborts on VAX if appropriate compiler flags are not set.	1/96	Rejected
41	Add antenna boresight elevation check in clutter algorithms in order to speed up simulation.	May improve execution time.	1/96	Pending
42	Axial force component may be missing in SA-8 simulation.	May result in erroneous missile response to fin deflections.	1/96	Rejected
43	Premature model termination.		1/96	Pending
44	SA-5 Doppler waveform is not consistent with latest intelligence.	May result in erroneous system performance predictions.	1/96	Approved

TABLE 3.0-1. Model Deficiency Reports for ESAMS 2.7. (Contd.)

MDR	Description	Implications for Use	Date Last Reviewed	Decision
45	SA-5 Doppler reacquisition algorithm is not consistent with latest intelligence.	May result in erroneous system performance predictions.	1/96	Pending
46	SA-5 guidance algorithm is not consistent with latest intelligence.	May result in erroneous system performance predictions.	1/96	Pending
47	SA-5 launch computer is not consistent with latest intelligence.	May result in erroneous system performance predictions.	1/96	Pending
48	SA-5 thrust data is not consistent with latest intelligence.	May result in erroneous system performance predictions.	1/96	Pending
49	ESAMS Threat Manual does not reference appropriate intelligence sources.	Makes verification of intelligence data difficult.	1/96	Pending
50	Documentation discrepancies in the User's Manual for termination codes. Errors in the header information for subroutine SUMNOF.	May cause user confusion.	5/96	Pending
51	Documentation discrepancies in the User's Manual for termination codes. Incomplete header information in subroutine SUMMSG.	May cause user confusion.	5/96	Pending
52	The PROGC variable RNOISE does not disable noise sources as documented in User's Manual.	May cause user confusion.	5/96	Pending
53	(This is a duplicate of MDR 52_2.7)		5/96	Pending
54	There are errors in the calculation of reactive target maneuvers.	May result in unexpected profiles when using the beam or extend maneuver options.	5/96	Pending
55	There is an error in computing the bistatic Doppler shift from towed decoys.	The Doppler signal used by semi-active missiles is incorrect and may affect Doppler tracking performance.	5/96	Pending

TABLE 3.0-2. Model Deficiency Reports Pending for ESAMS 2.x.

MDR	Description	Implications for Use	Date Reviewed	Decision
1	Specular multipath not correctly modeled.	Use of the multipath option may result in erroneous results.	3/14/95	Rejected
2	Target flight path is not correctly updated in subroutine MULTIP.	Use of the multipath option may result in erroneous results.	3/14/95	Rejected
3	Multipath signals in native multipath algorithms are erroneously dependent on facet size.	Use of the multipath option may result in erroneous results.	3/14/95	Rejected
4	There are errors in the formulae for multipath voltage calculations in subroutine MLTRSP.	Use of the multipath option may result in erroneous results.	3/14/95	Rejected
5	The multipath option in ESAMS 2.6.3b sometimes results in divide by zero because of undefined variables in subroutine MULTIP.	Use of the multipath option may result in erroneous results.	7/25/95	Approved
6	Current version of ESAMS does not model any version of the Roland SAM system	Precludes analyses of Roland effectiveness against air vehicles.	7/25/95	Approved

TABLE 3.0-3. Model Deficiency Reports Pending for ESAMS 2.6.3.

MDR	Date Reviewed	Description	Implications for Use
SURV-5	7/14/94	Transposed variable definitions in prolog.	Code documentation improvement.
SURV-6	7/14/94	Inconsistent use of dummy arguments in subroutine calls.	Code documentation improvement.
SURV-7	10/11/94	Variable ANTSEN in common block ECMD documented incorrectly.	Code documentation/quality improvement.
SURV-8	7/14/94	Correct discussion of two-dimensional table look-up in User's Manual.	Documentation improvement.
SURV-13	10/11/94	Incorrect use of variable FBWIF2 for both intermediate frequency bandwidth and doppler filter bandwidth for radars with doppler processing.	Code quality improvement.
SURV-14	10/11/94	ESAMS doesn't account for pulse integration gain.	Model enhancement.
SURV-35	10/11/94	Compilation problems with subroutine AM4C.	Enable SGI users to compile ESAMS.
SURV-39	10/11/94	Array POSSBL in subroutine PREPCH should be dynamically sized.	Impact of anomaly is unknown.
SURV-47	10/11/94	Enhancements requested to support JJTAEWS analyses.	Significant model enhancements.
SURV-48	10/11/94	Incorporation of ESAMS 2.6.2 ASC/XRE modifications into official baseline.	Significant model changes/enhancements.
SURV-49	10/11/94	Report of known problems with ESAMS 2.6.2 ASC/XRE code.	Assurance that ASC/XRE modifications do not corrupt baseline if incorporated into ESAMS.

3.4 IMPLICATIONS FOR MODEL USE

The ESAMS software design assumptions are well-documented in the ESAMS User's Manual and Analyst's Manual, and the principal assumptions are also duplicated in Section 3.1 of this ASP along with their implications for model use. In additional, the relatively large and active ESAMS user group has been effective in the identification and documentation of software bugs in the distributed code. These are also summarized in this section (see Table 3.3-1) with implications for model use. This information allows new users to easily decide whether ESAMS is appropriate for their analysis application.

Model Deficiency Reports Resolved by ESAMS CCB.

MDR	Date Approved	Description	Implications for Use
SURV-1	4/22/94	Delete alternate Euler angle system processing in guidance computers.	This is a short-term fix; long term, the guidance computers should be redesigned to accept Euler angles.
SURV-2	4/22/ 94	Incorrect tracking/lock-on logic check.	Improve lock-on-to-seeker logic.
SURV-3	4/22/ 94	Prevent divide by zero fault when target is above the site.	Prevent run-time crash.
SURV-4	4/22/ 94	Update version date in the code.	Aid user in determining version number.
SURV-9	7/19/94	Incorrect ring radius calculation in circular site setup option.	Improve determination of threat zone of influence.
SURV-10	10/11/ 94	System not calibrated, and terminates too early, if seeker does not lock-on.	Improve system calibration.
SURV-12	7/14/ 94	Update version date in the code.	Aid user in determining version number.
SURV-15	10/11/ 94	Anomalous failures to acquire.	Improve modeling of acquisition radars.
SURV-16	10/11/94	Track-while-scan radar systems are initialized to tracking instead of not tracking.	Improve radar tracking logic.
SURV-18	10/11/94	Incorrect range tracking for SA-4.	Improve system response for moderate SNR levels.
SURV-22	10/11/94	Variable TIMFUZ not initialized.	Correct erroneous fuzing times and distances after first shot in a run.
SURV-23	10/11/94	Variable RCSTYP defaults to 0; should be explicitly set to 0.	Allow search utilities to find where variable is set in code; improve code quality.
SURV-24	10/11/94	Clutter integration length is too large, leading to improper values of clutter strength.	Clutter is overestimated.
SURV-25	10/11/94	Headers in some data files are missing.	Errors result in user confusion.
SURV-26	10/11/94	Subroutine FACIN always sets IFACTI flag, leading in some cases to misleading output message.	Incorrect error message prevents user from ascertaining real cause of missile failure.
SURV-27	10/11/94	In many cases, model gives “Max. tracking rate exceeded” message, in spite of rate limiting in guidance computer.	Error causes incorrect conclusions about missile failure.
SURV-33	10/11/94	Error trap on variable ACQTIM uses simulation time step instead of radar time step.	Improve acquisition radar logic.
SURV-38	10/11/94	Radar not cycled between track establishment and missile launch.	Smooth simulation time stepping.
SURV-42	10/11/94	When target is masked, site statistics show target SNR is too low.	Improve simulation termination processing.
SURV-43	10/11/94	Array WAVFRM in RDRD data block needs table sizes.	Error prevents proper functioning of SA-11, SA-12, and SA-N7 missiles.
SURV-51	10/11/94	Antenna height for SA-12 incorrect.	Corrected height better reflects missile’s capability against low-altitude targets.
SURV-54	10/11/94	Turning on multipath prevents target detection.	Improve multipath processing.
SURV-57	11/7/94	Incorrect modeling of SA-15 missile.	SA-15 flies like bullet, rather than a missile.
SURV-63	3/14/94	Seeker pulse width for several systems is zero in RDRD data file.	Seeker detection threshold is zero for those systems.

Model Deficiency Reports Pending for ESAMS 2.6.2.

MDR	Date Last Reviewed	Description	Implications for Use
SMART-1	8/6/93	Incorrect simulation of a response to a sophisticated swept-square wave technique.	Some jamming techniques may not be correctly assessed; could lead to incorrect evaluation of low-observable aircraft survivability.
SMART-2	8/6/93	Incorrect range track loss against some target maneuvers.	Impact of target maneuvers on aircraft survivability could be incorrectly assessed.
SMART-3	8/6/93	Incorrect Native Multipath calculation of antenna gain.	Multipath degradation will be more severe than presently identified.
SMART-4	8/6/93	Incorrect number of target signals on the signal bus.	Under certain circumstances, TRGEP array could be overwritten, with unpredictable results.
SMART-5	8/6/93	Incorrect calling parameters in GRACE multipath subroutine.	For large bistatic angles, the error in the bistatic RCS returned by TGTRCS could be significant.
SMART-6	8/6/93	Incorrect GRACE code weights used for Doppler centroid calculation.	Magnitude of anomaly is unknown.
SMART-7	8/6/93	Incorrect calculation of GRACE code illumination patch length.	The effect of multipath signals in tracking errors, especially for low-altitude engagements, is underestimated.
SMART-8	9/1/93	Incorrect glint computation for maneuvering targets.	Glint effect may not be modeled with sufficient fidelity for highly maneuvering targets.
SMART-9	9/2/93	No random clutter magnitude.	No randomness for clutter will occur during replications of runs.
SMART-10	2/9/93	Incorrect multipath timing and size computation.	Multipath could have unrealistically large impact.
SMART-12	7/29/94	Incorrect target position for multipath calculations.	Multipath returns are improperly calculated.
SMART-16	7/29/94	Incorrect time step used in ACQTRK subroutine.	Impact of this anomaly is unknown.
SURV-41	10/11/94	Arguments to sine and cosine functions in subroutine RESLV2 are incorrect.	Impact of this anomaly is unknown.
SURV-50	10/11/94	Inconsistent use of variable ILOCK among missile models.	Impact of this anomaly is unknown.
SURV-58	11/3/94	Floating-point exception in subroutine RANDMC.	Impact of this anomaly is unknown.
SURV-60	(unknown)	Cannot run ESAMS on HP workstation.	Impact of this anomaly is unknown.

Model Deficiency Reports Rejected for ESAMS 2.7.

MDR	Date Reviewed	Description
SURV-11	10/11/94	Problems running ESAMS in stochastic mode.
SURV-17	10/11/94	SA-6 simulation stops when missile seeker loses detection; reacquisition logic not executed.
SURV-32	10/11/94	Incorrect dimensioning of CFAR mask matrix in subroutine INIDET. (MDR # is also SMART-15)
SURV-36	10/11/94	Infinite loops in subroutine DRVGA on SGI computer system.
SURV-40	10/11/94	Close file statement missing from subroutine RDSMF1.
SURV-44	10/11/94	Problematic SA-6 shots.
SURV-45	10/11/94	Incorrect “time to go” calculation in subroutine TDDPLY.
SURV-46	10/11/94	Malfunctioning of the SA-6 model.
SURV-52	10/11/94	Compilation error on SGI computer system.
SURV-53	10/11/94	Duplicate and/or mislabeled data in ALQ161 data file.